

## Short Communication

# Howling shadows: First report of domestic dog attacks on globally threatened mountain tapirs in high Andean cloud forests of Colombia

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## Abstract

Domestic dogs (*Canis lupus familiaris*) are recognised worldwide not only as man's best friend, but also as a form of anthropogenic edge effect impacting wildlife through predation, competition and disease infection. In the Northern Andes, there is growing evidence of dogs inducing activity shifts or alterations in the habitat use of native mammalian species. However, little information exists on direct attacks of dogs on wildlife, even in the case of species of conservation concern such as the mountain tapir (*Tapirus pinchaque*). Here, we used camera traps to report two cases of dogs chasing and attacking mountain tapirs in a protected area of the Central Andes of Colombia. The first event showed a direct physical contact between a living adult mountain tapir and two dogs, but the picture's angle did not lead to observable signs of wounds or other injuries. The second event showed an adult mountain tapir running while being chased by the same two dogs of the first event, denoting a stressful moment for the tapir. This may have negative consequences on the populations of mountain tapirs through decreased reproductive performance and foraging efficiency, increased potential for disease outbreaks and more. Population management and control of domestic dogs inside and around protected areas must be considered a priority in future conservation actions to support a healthy population of mountain tapirs and other imperilled species in the region.

**Key words:** anthropogenic edge effect, domestic dogs, invasive species, population management, *Tapirus pinchaque*

## Introduction

Domestic dog incursion into protected areas is considered a global threat to wildlife that is difficult to mitigate because of the inherent social dilemma of controlling populations of man's best friend (Hughes and Macdonald 2013). Domestic dogs (hereafter dogs) are considered a type of edge effect on wildlife, as they are highly mobile, ecologically flexible hyper-abundant carnivores

that can prey on and compete with other species as well as transmit several infectious diseases (Doherty et al. 2017; Costanzi et al. 2021; Gompper 2021). In wildlife management, dogs can be classified as house, loose, stray and feral according to ownership status, ranging behaviour and location (Contreras-Abarca et al. 2022). Owned dogs can be confined (house) or not (loose) inside private spaces, with their core areas never occurring outside the owner's domain (Contreras-Abarca et al. 2022). Unowned dogs can facultatively include human settlements inside their core areas (stray) or can only be found in the wilderness avoiding human contact (feral) (Contreras-Abarca et al. 2022). The impact of dogs on wildlife is often focused on the edge between the wildland-urban interface; however, dogs can cross edge boundaries and not only invade, but also thrive in adjacent habitats, either protected or not (Lacerda et al. 2009; Silva-Rodríguez and Sieving 2012; Paschoal et al. 2018).

Dogs can contribute to the extinction of vertebrate species, can imbalance the trophic dynamics amongst predator guilds and even have the potential to collapse entire ecological communities (Vanak and Gompper 2009; Hughes and Macdonald 2013; Gompper 2021). Despite the documented existence of 11 vertebrate extinctions and the potential threat over another 188 imperilled species worldwide, the damage to biodiversity by dogs is thought to be under-estimated (Doherty et al. 2017). In the Tropical Andes, camera traps showed threatened mammals like mountain tapirs (*Tapirus pinchaque*) and Andean bears (*Tremarctos ornatus*) being disturbed by dog presence through increased diurnal vigilance to dog encounters and decreased occupancy in sites with intense dog activity (Zapata-Ríos and Branch 2016, 2018). Dogs can also disturb other large mammal populations worldwide, including pudus (*Pudu puda*) in Chile, white-tailed deer (*Odocoileus virginianus*) in United States, Blackbucks (*Antilope cervicapra*) in India, African wild dogs (*Lycaon pictus*) and lions (*Panthera leo*) in the Serengeti and many others (Young et al. 2011; Gompper 2021). Unlike large carnivores and horned ungulates, tapirs can be more susceptible to disturbance from dogs as they lack additional defensive weaponry beyond their body size, such as large canines, elongated claws and horns (Stankowich 2012; Metz et al. 2018).

Mountain tapirs are listed as 'Endangered' according to the IUCN Red List both worldwide and in Colombia, with declining populations due to habitat loss and poaching (Lizcano et al. 2016). However, the impacts of dogs on mountain tapir populations are largely unknown across their geographic range. The 'Status and Action Plan for the Mountain Tapir' highlighted that packs of feral dogs can potentially kill mountain tapirs in Ecuador (Downer 1997). Notably, although most of the geographic range of mountain tapirs lies in Colombia (28000 km<sup>2</sup>, (Lizcano et al. 2015)) compared with Ecuador (21000 km<sup>2</sup>, (Ortega-Andrade et al. 2015)) and Peru (1830 km<sup>2</sup>, (More et al. 2022)), evidence confirming the negative impacts of dogs on the species therein is lacking. Thus, obtaining evidence of potential negative mountain tapir-dog interactions is crucial to planning successful conservation actions for the long-term persistence of this endangered herbivore. Here, our aim was to describe two instances of dogs chasing and attacking mountain tapirs in a protected cloud forest from the Western foothills of the Central Andes of Colombia.

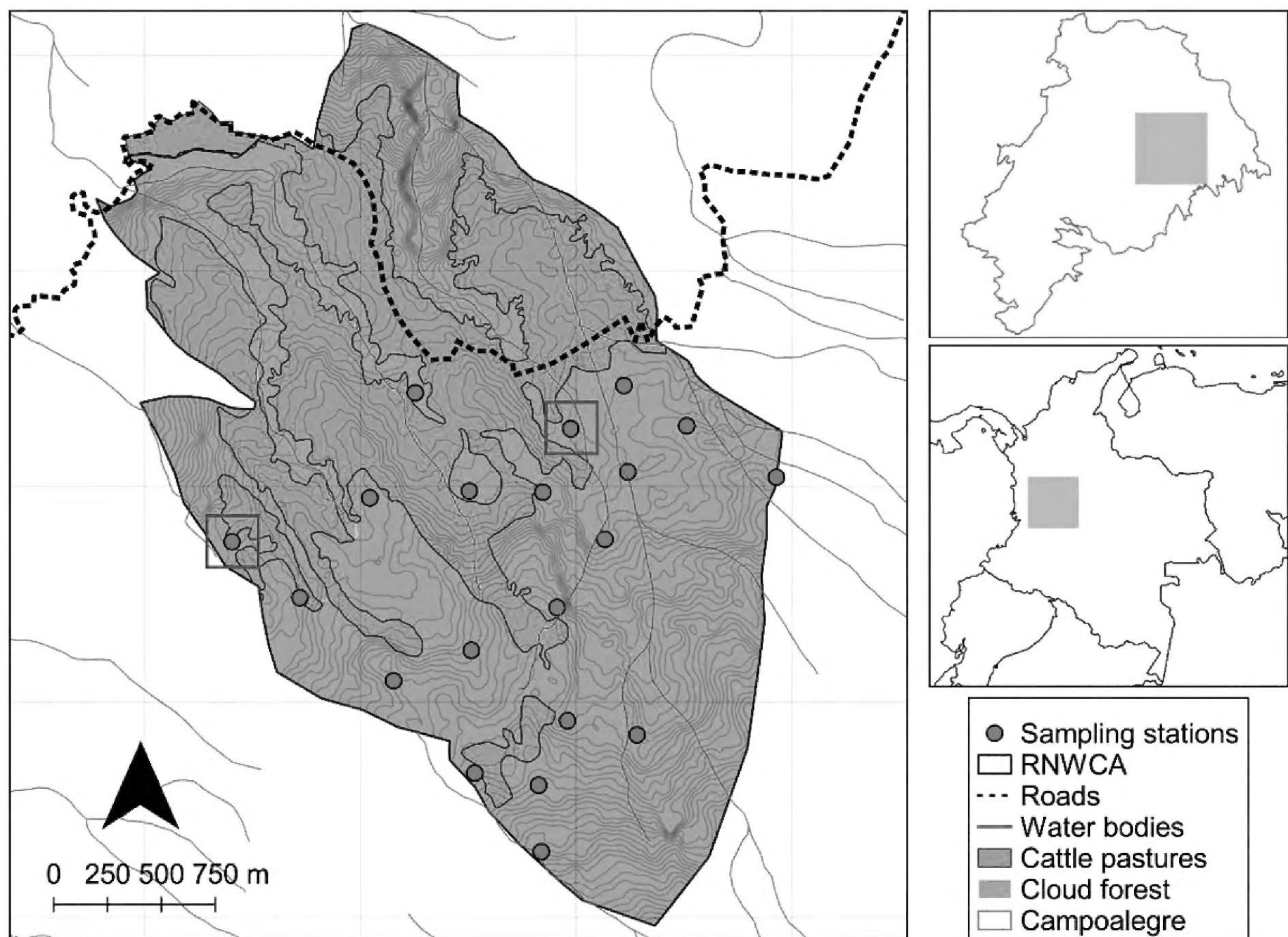
## Methods

The study was conducted in the Northern part of the Campoalegre Soil Conservation District in the municipality of Santa Rosa de Cabal, department of Risaralda, Colombia ( $4^{\circ}50.990'N$ ,  $75^{\circ}29.490'W$ ). The study area is a  $7.32 \text{ km}^2$  expanse of land named “WILD Campo Alegre” recently acquired by the Danish NGO WILD Nature Foundation with the goal of restoring cloud forests in areas previously cleared for the establishment of cattle ranching (Fig. 1). The landscape is integrated by mosaics of montane cloud forest patches, secondary vegetation and vast expanses of grassland in early regeneration stages immersed between hills and valleys with numerous rivers and streams (Lizcano and Cavelier 2000). The nearest town to WILD Campo Alegre (Santa Rosa de Cabal) is at a distance of 10.6 km and connected by a single dirt road that crosses the middle of the Reserve as well as a few isolated households in its surrounding lands. The households are mainly inhabited by transient families of cowboys who are periodically hired to guard cattle.

The camera traps where we observed the events of dog attacks on mountain tapirs are part of a regular grid of single-camera sampling stations designed to monitor terrestrial vertebrate diversity with a focus on threatened species (Rovero and Zimmermann 2016). Besides mountain tapirs, other threatened mammal species which we have detected include the dwarf red-brocket deer (*Mazama rufina*), clouded tiger cat (*Leopardus pardinoi-des*), Andean bear and mountain coati (*Nasuella olivacea*). We installed a total of 20 camera traps (Blaze Video A262), stratified by the cloud forest cover with an average linear spacing of 569 m, following recommendations elsewhere (Kays et al. 2020; Lizcano et al. 2021). The camera traps were active from 16 September to 24 November 2023 (sampling effort: 1279 trap/nights, mean effort per camera: 63 days), while covering a survey area of  $6.97 \text{ km}^2$ . We set the cameras to take three pictures and a 15-second video every time an animal passed in front of the detection field. We conducted monthly visits to the sampling stations to replace batteries, memory cards and cameras, the latter in the case of damage or theft. We installed the cameras 0.3 – 0.4 m above the ground along natural wildlife trails, streams or areas with tracks or signs of terrestrial vertebrate presence, mainly medium and large-sized mammals and ground-dwelling birds (Rovero and Zimmermann 2016).

## Results

In total, we obtained 27 detections (raw pictures) of domestic dogs and 585 detections of mountain tapirs. During our fieldwork, we were able to obtain two different events in which a single adult mountain tapir was observed either being attacked (Fig. 2A) or chased (Fig. 2B) by dogs in two different sampling stations (one on 28 October 2023 at  $4^{\circ}50.811'N$ ,  $75^{\circ}29.149'W$ ; the other on 6 November 2023 at  $4^{\circ}50.804'N$ ,  $75^{\circ}30.084'W$ ). The two sampling stations in which we observed the attack and chasing events were separated by a linear distance of 1.72 km.



**Figure 1.** Map representing the area surveyed by the camera traps that detected the two events of dogs (red squares) chasing (left) and attacking (right) mountain tapirs in the private natural Reserve “WILD Campo Alegre” situated at the north-eastern extreme of the Campoalegre Soil Conservation District, Santa Rosa de Cabal, Colombia.

We observed two different dogs in the encounter events, one black and the other white-coloured, respectively (Fig. 2). In the first encounter sequence, which occurred in the early morning (08:02 h), we noted that both dogs were biting a living mountain tapir on its hind-limbs (Fig. 2A). In the second encounter event, which occurred before dawn (04:11 h), a single picture was taken of an adult mountain tapir running across the detection field, followed three minutes later by a white dog also running in front of the detection field. The black dog crossed 37 seconds after the detection of the white dog, searching with its head and nose close to the ground (Fig. 2B lower panel).

## Discussion

This is the first instance of camera traps recording dog attacks on mountain tapirs in a protected area of Colombia and raises an important conservation issue on a threatened and emblematic herbivore of the Andean cloud forest. We highlight that our observations are not isolated cases, as local people have previously reported the same dogs chasing and attacking mountain tapirs and cattle. Additionally, no detection of juvenile mountain tapirs was obtained in the present survey and recent efforts (2021) (Cepeda-Duque et al. 2023).



Figure 2. Photographic evidence of domestic dogs **A** attacking and **B** chasing mountain tapirs in a private protected area of the Central Andes of Colombia.

Our photographic evidence highlights the importance of using camera traps to improve our understanding of hardly detectable threats that may face imperilled species in montane landscapes with limited accessibility and difficult research conditions. A recent study in the Western Andes of Colombia did not find evidence that dog occurrence led to meaningful changes in habitat use of forest-dwelling mammal species (Bedoya-Durán et al. 2021). Our evidence suggests the opposite, where even a single pack of two or three dogs seems to pose a serious threat to a large and highly threatened mammal like the mountain tapir. There is evidence of dog attacks on mountain tapirs in the Central Andes of Ecuador (Castellanos et al. 2022), lowland tapirs (*T. terrestris*) in the Atlantic Forest (Lacerda et al. 2009; Lessa et al. 2016; Gatti et al. 2018), as well as guanacos (*Lama guanicoe*) and pudus (*Pudu puda*) in the Southern Andes of Chile (Silva-Rodríguez and Sieving 2012; Silva Rochefort and Root-Bernstein 2021). Other ungulate species from the area can also be at risk by staying in contact with dog populations, particularly smaller herbivores, such as dwarf red-broket deer and Northern pudu (*P. mephistophiles*).

If this negative interaction continues, potential consequences at the individual and population levels will emerge compromising the survival of mountain tapirs and other herbivores in the region as has been noted elsewhere (see (Young et al. 2011)). Individual consequences include increased vigilance and fear-induced stress, reduced foraging efficiency and social interactions and increased mortality due to injuries and diseases (Young et al. 2011; Gatti et al. 2018; Castellanos et al. 2022). Populational consequences include altered reproductive performance, increased potential of disease transmission in the population and changes in activity patterns and habitat use (Vanak and Gompper 2009; Young et al. 2011; Zapata-Ríos and Branch 2016, 2018). In this broken landscape, mountain tapirs evolved with non-cursor predators (i.e. pumas and Andean bears) morphologically adapted to hunt by ambush (Martín-Serra et al. 2015). Escaping from a cursorial predator adapted to sustain prolonged runs, such as the dog, comes at an anaerobic cost for mountain tapirs, increas-

ing their vulnerability to predation by fatigue or mortality by incidental falls (Hutchins and Geist 1987; Bryce 2021). Consequently, juvenile tapirs are more vulnerable to dog attacks than adults (Monette et al. 2020) and more information will enable us to discern whether the absence of juveniles in our study is due to direct (i.e. predation, chasing) and indirect pressures (i.e. risk perception) of dog interactions or other relevant predictors. In 1994, a re-introduced two-year radio-tracked female mountain tapir was found killed by rabies caused by a bite from an infected feral dog in Ecuador (Castellanos et al. 2022). Similarly, in the Atlantic Forest, a juvenile lowland tapir was found seriously injured after being bitten multiple times along its body, including the head, limbs and tail during a dog pack attack (Gatti et al. 2018). It is important to understand how the surrounding matrix and other anthropogenic pressures like tourism activities are creating the conditions for dogs to establish in protected areas. From this information, we can explore the best ways to mitigate the problem with the help of local authorities (Lacerda et al. 2009; Ribeiro et al. 2019).

Camera trap monitoring must continue documenting feral dog presence and attacks on wildlife and this information must be shared with the public via environmental outreach and social media. Moreover, capture-neuter-vaccinate-release programmes on stray dogs and organised campaigns with the help of locals to neuter and vaccinate owned dogs are strategies that must be permanently implemented in the vicinities of the reserve (Gompper 2021). We provide direct evidence of mountain tapirs being attacked and chased by dogs inside a protected area of the Central Andes of Colombia. If not properly managed, the problem of dog invasion in the habitat of mountain tapirs can scale to local extinctions of their populations and spread to other imperilled species as well. The demise of mountain tapirs in the Andean cloud forests can unravel substantial losses in the function and structure of this vital ecosystem while compromising the welfare of human societies existing therein.

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## Additional information

### Conflict of interest

The authors have declared that no competing interests exist.

### Ethical statement

No ethical statement was reported.

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## Author contributions

Conceptualization: JCCD. Data curation: JCCD. Formal analysis: JCCD. Funding acquisition: CFM. Investigation: EAC, JCCD. Methodology: JCCD, DJL. Project administration: CFM. Resources: CFM. Supervision: DJL. Validation: DJL. Writing - original draft: JCCD, DJL. Writing - review and editing: JCCD, CFM.

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## Data availability

All of the data that support the findings of this study are available in the main text.

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